UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/700,782	11/03/2003	Bioh Kim	SEMT119849	5493

26389 7590 04/25/2007

CHRISTENSEN, O'CONNOR, JOHNSON, KINDNESS, PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

EXAMINER	
WONG, EDNA	
ART UNIT	**PAPER NUMBER**
1753	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/25/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/700,782	Applicant(s) KIM ET AL.	
	Examiner Edna Wong	Art Unit 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-43* is/are pending in the application.

4a) Of the above claim(s) *1-19 and 38-43* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *20-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *March 29, 2004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Election/Restrictions

Applicant's election with traverse of Group **IV**, claims **20-37**, in the reply filed on March 21, 2007 is acknowledged. The traversal is on the ground(s) that since the invention of Group IV and the invention of Group VI relate to through-mask plating processes, the inventions are related and applicants assert that the restriction therebetween is improper. This is not found persuasive because the invention of Group VI requires the steps of removing the masking layer and removing at least portion of the barrier layer and the conductive layer exposed by the removal of the masking layer. The invention of Group VI requires a different field of search because the invention reads on fabricating C4 structures while the invention of Group IV reads on fabricating integrated circuits.

The requirement is still deemed proper and is therefore made FINAL.

Accordingly, claims **1-19 and 38-43** are withdrawn from consideration as being directed to a non-elected invention.

Specification

The disclosure is objected to because of the following informalities:

page 13, line 22, reference character “380” has been used to designate both an exemplary power supply and a workstation (from page 13, lines 10-11). It is unclear what reference character “380” designates.

page 13, line 29, the words -- (not shown) -- should be inserted after the number "400".

page 14, line 2, a -- . -- (period) should be inserted after the word "minute".

page 14, lines 25-26, reference character "30" has been used to designate both a conductive layer and a second thin metal film (from page 14, lines 10-13). It is unclear what reference character "30" designates.

Appropriate correction is required.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

I. Claims **20- 28** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Cohen** (US Patent No. 6,869,515 B2) in combination with **Tzanavaras et al.** (US Patent No. 5,421,987), **Bokisa** (US Patent No. 6,676,823 B1) and **Dubin et al.** (US Patent No. 5,972,192).

Cohen teaches a process for electroplating copper on a microelectronic workpiece in a through-mask plating application at a rate of at least 2 μm/min, said process comprising:

(a) providing a plating bath comprising:

(1) 50-85 g/L of Cu^{2+} (= 0.3 M $CuSO_4$);

(2) 50-100 g/L of H_2SO_4 (= 10% (v/v) H_2SO_4);

(3) 30-150 ppm of Cl^- (= ~60 ppm chloride ions) [col. 6, lines 21-22];

(4) à brightener (col. 2, lines 33-65; and col. 9, lines 39-43]; and

(5) water (col. 14, claim 9);

(b) providing a microelectronic workpiece having one or more through-mask openings with a conductive layer at the bottom of said opening (= an insulating mask such as an oxide, photoresist, or polyimide layer is patterned over a conductive metallic surface, exposing the metallic surface only at the bottom of the openings) [col. 1, lines 26-38];

(c) contacting said conductive layer with said plating bath (= immersing the substrate in an electrolyte contained in an electrochemical deposition cell) [col. 14, lines 6-7];

(d) providing electroplating power between said conductive layer and an anode

disposed in electrical contact with said bath (= electroplating is carried out through the openings in the insulating mask, and is confined inside the openings of the mask) [col. 1, lines 31-33]; and

(e) depositing copper onto said conductive layer at a rate of at least 2 μm/min (= plating rate of about 2.8 μm/min) [col. 9, lines 11-16 and lines 53-65].

The current density of said electroplating power is 100-300 mA/cm^2 (= 120 mA/cm^2) [col. 9,lines 11-13].

The current density of said electroplating power is 150-220 mA/cm^2 (= about 120 mA/cm^2 or higher) [col. 14, claims 7 and 8].

The workpiece is rotated (= a stationary anode/jet assembly with a rotating substrate assembly) [see Tzanavaras et al.: col. 8, lines 46-57] at a speed of 20-200 revolutions per minute (= a rotation speed of more than about 80 revolutions per minute) [col. 5, lines 33-39] and wherein said bath flows against said workpiece at a flow rate of 1-10 gallons per minute (= 0.25-10.0 gallons per minute) [see Tzanavaras et al.: col. 8, lines 37-40] (Cohen: col. 5, line 64 to col. 6, line 1; and col. 16, claims 27 and 33).

The bath has a temperature of 25-35°C (= room temperature).

The process of Cohen differs from the instant invention because Cohen does not disclose the following:

a. Wherein the plating bath comprises a wetting agent, as recited in claim 20.

Like Cohen, Bokisa teaches a high speed acid copper plating. Bokisa teaches

that the copper plating bath optionally contains one or more additives. Various additives either facilitate the plating process and/or improve the characteristics of the resultant layer of copper. Additives include brighteners, carriers, leveling agents, surfactants, *wetting agents*, complexing agents, chelating agents, reducing agents, promoters, and the like (col. 5, lines 6-11). Wetting agents promote leveling and brightening, as well as promoting bath stability (col. 6,lines 10-14).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the plating bath described by Cohen with wherein the plating bath comprises a wetting agent because a wetting agent would have promoted leveling and brightening, as well as promoting bath stability as taught by Bokisa (col. 6, lines 10-14).

b. Wherein the waveform of said electroplating power is a DC and a pulse with a 10-50% duty cycle at 50-1000 Hz, as recited in claim 23.

Like Cohen, Dubin teaches electroplating copper. Dubin teaches that the present invention addresses such reliability problems by providing a method wherein high aspect ratio openings in a dielectric layer are filled voidlessly with improved uniformity and increased grain size, thereby improving reliability and increasing electromigration resistance (col. 5, lines 32-37). In pulse electroplating, the thickness of the diffusion layer formed at the solution-electrode interface during plating is reduced, since Cu ions diffuse to the cathode surface while the current pulse is off. Pulse electroplating is

generally employed in metal finishing industries and comprises, in its simplest sense, metal deposition by pulse electrolysis, as by interrupted DC current, to electroplate parts. This is effected with *a series of pulses of DC current* of equal amplitude and duration in the same direction, separated by periods of zero current. The pulse rate (frequency) and ON and OFF interval x (duty cycle) are controllable to optimize electro-deposition in a particular situation. Pulse electroplating can be conducted by utilizing a constant current or with constant voltage pulses. In employing pulse electroplating in accordance with the present invention, one having ordinary skill in the art could easily optimize the relevant variables, such as the duty cycle, frequency and current density in a particular situation (col. 5, lines 50-67).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the waveform described by Cohen with wherein the waveform of said electroplating power is a DC and a pulse with a 10-50% duty cycle at 50-1000 Hz because high aspect ratio openings in a dielectric layer would have been filled voidlessly with improved uniformity and increased grain size, thereby improving reliability and increasing electromigration resistance as taught by Dubin (col. 5, lines 32-37).

Dubin teaches that Cu was electroplated to fill both trenches by employing unipolar (i.e., forward) pulse plating with a duty cycle of about 10% to about 90%, frequency of about 1 to about 1000 Hz and a current density of about 5 to about 50 mA/cm^2 (col. 8, Example 1).

c. Wherein the depositing step further comprising depositing copper to form a deposited feature having a smooth surface morphology, as recited in claim 26.

d. Wherein the depositing step further comprising depositing copper to form a deposited feature that has a substantially flat surface, as recited in claim 27.

e. Wherein the depositing step further comprising depositing copper to form a deposited feature that has a thickness variation of less than 10%, as recited in claim 28.

Bokisa teaches that *desirable characteristics* of a resultant copper layer formed include one or more of uniform thickness, excellent leveling, excellent ductility, lack of pinholes, bright finish, effective plating within circuit board through holes, and controllable thickness (col. 2, lines 27-32).

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Cohen discloses a process at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield similar results (MPEP § 2112(III)).

II. Claims **29-37** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Cohen** (US Patent No. 6,869,515 B2) in combination with **Tzanavaras et al.** (US Patent No. 5,421,987), **Bokisa** (US Patent No. 6,676,823 B1) and **Dubin et al.** (US Patent No. 5,972,192).

Cohen, Tzanavaras et al., Bokisa and Dubin are as applied as discussed above and incorporated herein.

The process of Cohen differs from the instant invention because Cohen does not disclose wherein the plating bath comprises a leveler, as recited in claim 29.

Cohen teaches that JECD plating *did not require* any additional (third component) "leveler" organic additive or the use of a complex pulse or periodic reversal pulse plating, in order to eliminate the spikes and steps common in the prior art ECD plating (col. 10, lines 27-31).

Like Cohen, Dubin teaches electroplating copper. Dubin teaches that a leveling agent is incorporated in the electroplating composition and periodically replenished as necessary, to ensure that an opening, particularly a high aspect ratio opening, e.g., greater than 3:1, is reliably voidlessly filled commencing at the bottom and progressing sequentially to the top of the opening, with improved uniformity and increased grain size (col. 6, lines 6, lines 1-7).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the plating bath described by Cohen with wherein the plating bath comprises a leveler because a leveler would have reliably voidlessly filled a high aspect ratio opening, e.g., greater than 3:1, commencing at the bottom and progressing sequentially to the top of the opening, with improved uniformity and increased grain size as taught by Dubin (col. 6, lines 6, lines 1-7).

Furthermore, as to "JECD plating did not require any additional (third component)

"leveler" organic additive or the use of a complex pulse or periodic reversal pulse plating", the disclosure of reference must be considered for what it fairly teaches one of ordinary skill in the art, pertinence of non-preferred disclosure must be reviewed in such light. *In re Meinhardt* 157 USPQ 270; and MPEP § 2123 and § 2141.02(VI).

Furthermore, adding a leveler to the plating bath disclosed by Cohen and pulsing the current does not appear to destroy his process.

III. Claims **20-23 and 25-28** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Dubin et al.** (US Patent No. 5,972,192) in combination with **Bokisa** (US Patent No. 6,676,823 B1).

Dubin teaches a process for electroplating copper on a microelectronic workpiece in a through-mask plating application at a rate of at least 2 μm/min, said process comprising:

(a) providing a plating bath comprising:

(1) Cu^{2+} (col. 7, line 62);

(2) H_2SO_4 (col. 7, line 63);

(3) Cl^- (col. 7, line 63);

(4) a brightener (col. 8, lines 1-3); and

(5) water (*inherent*);

(b) providing a microelectronic workpiece having one or more through-mask openings with a conductive layer at the bottom of said opening (col. 7, lines 44-57);

(c) contacting said conductive layer with said plating bath (col. 8, Example 1);

(d) providing electroplating power between said conductive layer and an anode disposed in electrical contact with said bath (col. 8, Example 1); and

(e) depositing copper onto said conductive layer at a rate (col. 8, Example 1).

The waveform of said electroplating power is a DC (col. 5, lines 50-67) and a pulse (= a unipolar pulse) with a 10-50% duty cycle (= about 10% to about 90%) at 50-1000 Hz (= about 1 to about 1000 Hz) [col. 8, Example 1].

The bath has a temperature of 25-35°C (= room temperature).

The process of Dubin differs from the instant invention because Dubin does not disclose the following:

a. Wherein the plating bath comprises:

(1) 50-85 g/L of Cu^{2+};

(2) 50-100 g/L of H_2SO_4; and

(3) 30-150 ppm of Cl^-, as recited in claim 20.

Dubin teaches that the electroplating compositions employed for electroplating Cu or a Cu alloy are conventional and, hence, not described in detail (col. 7, lines 59-61).

Like Dubin, Bokisa teaches a high speed acid copper plating. Bokisa teaches a plating bath comprising:

(1) 50-85 g/L of Cu^{2+} (= about 1 g/l to about 150 g/l of a copper salt (as

Cu^{2+})) [col. 3, lines 20-25];

(2) 50-100 g/L of H_2SO_4 (= about 30 g/l to about 280 g/l of sulfuric acid) [col. 4, lines 12-22]; and

(3) 30-150 ppm of Cl^- (= about 0 to about 500 ppm of chloride ions) [col. 4, line 60 to col. 5, line 5].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the plating bath described by Dubin with wherein the plating bath comprises: (1) 50-85 g/L of Cu^{2+}; (2) 50-100 g/L of H_2SO_4; and (3) 30-150 ppm of Cl^- because such electroplating compositions are conventionally employed for electroplating Cu as taught by Bokisa (col. 3, lines 20-25; col. 4, lines 12-22; and col. 4, line 60 to col. 5, line 5).

b. Wherein the plating bath comprises a wetting agent, as recited in claim 20.

Like Dubin, Bokisa teaches an acid copper plating. Bokisa teaches that the copper plating bath optionally contains one or more additives. Various additives either facilitate the plating process and/or improve the characteristics of the resultant layer of copper. Additives include brighteners, carriers, leveling agents, surfactants, *wetting agents*, complexing agents, chelating agents, reducing agents, promoters, and the like (col. 5, lines 6-11). Wetting agents promote leveling and brightening, as well as promoting bath stability (col. 6,lines 10-14).

It would have been obvious to one having ordinary skill in the art at the time the

invention was made to have modified the plating bath described by Dubin with wherein the plating bath comprises a wetting agent because a wetting agent would have promoted leveling and brightening, as well as promoting bath stability as taught by Bokisa (col. 6, lines 10-14).

c. Wherein depositing copper onto said conductive layer is at a rate of at least 2 μm/min, as recited in claim 20.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Dubin discloses a process at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield similar results (MPEP § 2112(III)).

Furthermore, the process disclosed in Example 1 of Dubin inherently has a copper deposition rate. Why wouldn't it be at a rate of at least 2 μm/min?

d. Wherein the current density of said electroplating power is 100-300 mA/cm^2, as recited in claim 21.

e. Wherein the current density of said electroplating power is 150-220 mA/cm^2, as recited in claim 22.

Dubin teaches that in pulse electroplating, the thickness of the diffusion layer formed at the solution-electrode interface during plating is reduced, since Cu ions

diffuse to the cathode surface while the current pulse is off. Pulse electroplating is generally employed in metal finishing industries and comprises, in its simplest sense, metal deposition by pulse electrolysis, as by interrupted DC current, to electroplate parts. This is effected with a series of pulses of DC current of equal amplitude and duration in the same direction, separated by periods of zero current. The pulse rate (frequency) and ON and OFF interval x (duty cycle) are controllable to optimize electro-deposition in a particular situation. Pulse electroplating can be conducted by utilizing a constant current or with constant voltage pulses. In employing pulse electroplating in accordance with the present invention, one having ordinary skill in the art could easily optimize the relevant variables, such as the duty cycle, frequency and *current density* in a particular situation (col. 5, lines 50-67).

Dubin teaches a current density of about 5 to about 50 mA/cm^2 (col. 8, Example 1); and an anodic pulse current density is of about 3 mA/cm^2 to about 160 mA/cm^2 in Example 2 (col. 8).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the current density described by Dubin with wherein the current density of said electroplating power is 100-300 mA/cm^2; and wherein the current density of said electroplating power is 150-220 mA/cm^2 because the current density is a result-effective variable and one skilled in the art has the skill to calculate the current density that would have determined the success of the desired reaction to occur, e.g., in a particular situation as taught by Dubin (col. 5, lines 50-67)

[MPEP § 2141.03 and § 2144.05(II)(B)].

f. Wherein the depositing step further comprising depositing copper to form a deposited feature having a smooth surface morphology, as recited in claim 26.

g. Wherein the depositing step further comprising depositing copper to form a deposited feature that has a substantially flat surface, as recited in claim 27.

h. Wherein the depositing step further comprising depositing copper to form a deposited feature that has a thickness variation of less than 10%, as recited in claim 28.

Bokisa teaches that *desirable characteristics* of a resultant copper layer formed include one or more of uniform thickness, excellent leveling, excellent ductility, lack of pinholes, bright finish, effective plating within circuit board through holes, and controllable thickness (col. 2, lines 27-32).

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Dubin discloses a process at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield similar results (MPEP § 2112(III)).

IV. Claim **24** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Dubin et al.** (US Patent No. 5,972,192) in combination with **Bokisa** (US Patent No. 6,676,823

B1) as applied to claims 20-23 and 25-28 above, and further in view of **Cohen** (US Patent No. 6,869,515 B2) and **Tzanavaras et al.** (US Patent No. 5,421,987).

Dubin and Bokisa are as applied as discussed above and incorporated herein.

The process of Dubin differs from the instant invention because Dubin does not disclose wherein said workpiece is rotated at a speed of 20-200 revolutions per minute and wherein said bath flows against said workpiece at a flow rate of 1-10 gallons per minute, as recited in claim 24.

Like Dubin, Chen teaches an acid copper plating. Chen teaches that the workpiece is rotated (= a stationary anode/jet assembly with a rotating substrate assembly) [see Tzanavaras et al.: col. 8, lines 46-57] at a speed of 20-200 revolutions per minute (= a rotation speed of more than about 80 revolutions per minute) [col. 5, lines 33-39] and wherein said bath flows against said workpiece at a flow rate of 1-10 gallons per minute (= 0.25-10.0 gallons per minute) [see Tzanavaras et al.: col. 8, lines 37-40] (Cohen: col. 5, line 64 to col. 6, line 1; and col. 16, claims 27 and 33).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the workpiece described by Dubin with wherein said workpiece is rotated at a speed of 20-200 revolutions per minute and wherein said bath flows against said workpiece at a flow rate of 1-10 gallons per minute because substantially uniform agitation of the electrolyte across the field surface of the substrate would have facilitated void-free filling and increase the plating rate without "burning" as taught by Cohen (col. 9, lines 44-65; and col. 16, claim 27).

V. Claims **29-32 and 34-37** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Dubin et al.** (US Patent No. 5,972,192) in combination with **Bokisa** (US Patent No. 6,676,823 B1).

Dubin and Bokisa are as applied as discussed above and incorporated herein.

Dubin also teaches wherein the plating bath comprises a leveler (col. 7, lines 64-67)

VI. Claim **33** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Dubin et al.** (US Patent No. 5,972,192) in combination with **Bokisa** (US Patent No. 6,676,823 B1) as applied to claims 29-32 and 34-37 above, and further in view of **Cohen** (US Patent No. 6,869,515 B2) and **Tzanavaras et al.** (US Patent No. 5,421,987).

Dubin, Bokisa, Cohen and Tzanavaras et al., are as applied as discussed above and incorporated herein.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Edna Wong
Edna Wong
Primary Examiner
Art Unit 1753

EW
April 21, 2007